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1CAN020904

February 10, 2009

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Licensee Event Report 50-313/2008-001-00
Arkansas Nuclear One – Unit 1
Docket Nos. 50-313
License Nos. DPR-51

Dear Sir or Madam:

In accordance with 10CFR50.73(a)(2)(iv)(A), enclosed is the subject report concerning two manual reactor trips from power.

There are no new commitments contained in this submittal.

Sincerely,

DBB/dce
Enclosure

cc: Mr. Elmo Collins
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
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Arlington, TX 76011-4125

NRC Senior Resident Inspector
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NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

Estimated burden per response to comply with this mandatory information collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE Two Manual Reactor Trips From Power in Response to Abnormal Control Rod Movement Caused by Control Rod Drive Control System Component Degradation.

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
12	12	2008	2008	- 001 -	00	02	10	2009	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE
1

10. POWER LEVEL
32/100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☒ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER- Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
David B. Bice, Acting Manager, Licensing	479-858-4710

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
[redacted]	AA	RLY	P297	Y	E	AA	RJX	B015	N

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE)	☒ NO	[redacted]	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 0855 CST, on December 12, 2008, and again at 1212 CST, on December 20, 2008, Arkansas Nuclear One, Unit-1, initiated a manual plant trip from power in accordance with plant procedures in response to receipt of asymmetric rod alarms and recognition of abnormal control rod group 7 movements. The Control Rod Drive Control System (CRDCS) was in automatic at the time of each occurrence. Post trip responses were normal with all plant systems functioning as expected and with no safety system actuations. Testing and analysis determined that the probable root cause was degradation of two of the Automatic Bus Transfer (ABT) relays as the result of inadequate preventive maintenance. The two subject ABT relays were replaced as well as the programmer for the Group 7 Control Rods which was identified as single point failure vulnerable. In addition to the immediate actions to replace the above components, actions have been initiated to evaluate and upgrade the preventive maintenance associated with the CRDCS. Additional online monitoring requirements were implemented to obtain diagnostic information and enhanced inspection requirements were implemented for the CRD programmers. Both occurrences were reported to the NRC Operations center pursuant to 10CFR50.72 reporting requirements.

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NARRATIVE

A. Plant Status

At the time of each occurrence of this event, Arkansas Nuclear One, Unit 1 (ANO-1) plant conditions were as follows:

Occurrence 1: At 0855 CST, on December 12, 2008, ANO-1 was in Mode 1 following startup from Refueling Outage 21 (1R21) with the reactor at approximately 32% power and in preparation for performance of a Nuclear Instrumentation (NI) [IG] calibration.

Occurrence 2: At 1212 CST, on December 20, 2008, ANO-1 was in Mode 1 at approximately 100% power.

B. Event Description

Occurrence 1: At 0855 CST, on December 12, 2008, following startup from 1R21, ANO-1 was at approximately 32% power with rod control in automatic, in preparation for a NI calibration when a malfunction in the Control Rod Drive Control System (CRDCS) [AA] caused the group 7 control rods to be released. Group 7 control rods were almost fully inserted before the CRDCS re-latched and caught the control rods prior to full insertion. Once re-latched, CRDCS began driving the rods back out, as the abnormality had apparently cleared. Operators received an asymmetric rod alarm and noted an abnormal rod pattern on Group 7 with reactor power lowering. At that time, Operations manually tripped the reactor in accordance with plant procedure. Post trip responses were normal with all plant systems functioning as expected and with no safety system actuations.

Troubleshooting efforts concluded that the most likely cause of the condition was the programmer assembly for the Group 7 control rods which was replaced with a spare unit. Testing was conducted and ANO-1 returned to power on December 13, 2008, at 0630 CST.

Occurrence 2: At 1212 CST, on December 20, 2008, while at approximately 100% power, Operators again received an asymmetric rod alarm and noted an abnormal rod pattern on Group 7. Operators manually tripped the reactor in accordance with plant procedures. Post trip responses were normal with all plant systems functioning as expected and with no safety system actuations. Secondary safeties lifted for approximately 1 minute.

Troubleshooting efforts and a more detailed cause investigation was initiated. The programmer assembly and two ABT relays were replaced. Testing of the system was performed and ANO-1 was returned to power operation on December 23, 2008, at 1714 CST.

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NARRATIVE

C. Root Cause

The eight control rods of group 7 are typically positioned under automatic control based on demand signals from the Integrated Control System (ICS) to the CRDCS to maintain reactor power at the required level. The ICS signal is provided to the programmer via relays to move rods depending on the command initiated. Firing of silicone controlled rectifiers (SCR) is supervised by a programmer dedicated to group 7. The programmer is a microcontroller based component which responds to commands from ICS (or alternately, manual control) by sequencing the firing of the six phases of power as needed to provide rod motion. If no movement requests are initiated the microcontroller will maintain two phases continuously energized to hold the rods in a fixed position. If the programmer does not provide any SCR firing demand outputs, the rods will be released.

The programmer control power is derived from two redundant AC power sources. The primary source is provided from B631, the secondary source is provided from A501. A control power Automatic Bus Transfer (ABT-3) scheme provides power to the programmer from the designated primary AC source and rapidly switches to the secondary source if a loss of primary voltage is sensed. This is accomplished via the switching of relays K1 and K2 located in the ABT-3.

The most probable root cause of the dropping of the group 7 rods is the intermittent failure of the K1 and/or K2 ABT relays. The K1 and K2 relays were original equipment, and were found to be degraded.

A possible root cause is a failure associated with the programmer assembly. The programmer assembly presents a single point failure vulnerability. The failure of the 15 V power supply (internal to the programmer assembly) would directly cause the failure of the Programmer Micro Controller Unit.

D. Corrective Actions

The degraded K1 and K2 relays and the programmer assembly were replaced and tested.

Additional online monitoring requirements were implemented to obtain additional diagnostic information.

Additional inspection requirements were implemented for the CRDCS programmers.

Preventive Maintenance Program strategy improvement was initiated for the CRDCS.

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E. Safety Significance

The safety significance associated with these occurrences is considered to be minimal.

Occurrence 1: Although Group 7 Control Rods re-latched and began to withdraw, prompt operator action to perform a manual reactor trip prevented any automatic protective setpoints from being approached. At the time of the reactor trip, the nuclear overpower trip setpoint was set lower than normal, 40% versus 104.9%, while performing physics testing following startup from 1R21 refueling outage. Post trip plant response was normal with no complications and the plant was stabilized in Mode 3, Hot Standby, without incident. All safety systems performed as designed with no automatic safety features actuating.

Occurrence 2: No outward rod motion occurred as a result of this event due to the fact that Group 7 rods re-latched at different heights. This caused an out inhibit associated with the CRD system to prevent outward rod motion. Post trip transient response for this event was normal with no complications and the plant was stabilized in Mode 3, Hot Standby, without incident. All safety systems performed as designed with no automatic safety features actuating. Main Steam safeties lifted for approximately 1 minute as a result of this reactor trip. This is considered to be a normal response due to plant power at 100% at the onset of the event. All main steam safeties reseated properly as designed.

Nuclear safety, Industrial Safety, Radiological Safety and General safety of the public were not challenged at any time during these events.

F. Basis for Reportability

The first occurrence of the event was reported on December 12, 2008, at 1048 CST, as a 4-hour Non-Emergency 10CFR50.72(b)(2)(iv)(B) RPS Actuation (scram).

The second occurrence of the event was reported on December 20, 2008, at 1323 CST, as a 4-hour Non-Emergency 10CFR50.72(b)(2)(iv)(B) RPS Actuation (scram).

A manual reactor trip in response to actual plant conditions is reportable pursuant to 10CFR50.73(a)(2)(IV)(A).

G. Additional Information

There are no previous similar events reported by ANO.

Energy Industry Identification System (EIIS) codes are identified in the test as [XX].